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IT is perhaps unsafe to say that the subservience of public trust to private or political ends is more iniquitous in one office than in another; but at least it may be said that officers whose duty is neither clerical, nor strictly executive or ministerial, nor constrained by the safeguard of any routine, ought to be especially trustworthy. Those who have to exercise a repressive authority in cases which affect the immediate safety of the public, and who need to do it with great firmness, decision, judgment, and impartiality, most of all if their duties require special knowledge of an unusual kind, need to be selected with especial care, to be above suspicion either of incompetence or of unfaithfulness, and ought to be put out of reach at least of ordinary temptations to favoritism and dishonesty. There are few positions to which these considerations apply with more force than to that of an Inspector of Buildings in a large city; few in which there is a greater opportunity for slackness, corruption, or favor, or in which the consequences of these or of incompetence are likely to be more disastrous. New York is a city that has not been favored in its inspectors, we believe, and the *Times* has lately been giving some rather miserable pictures of the management of their chief, the Superintendent of Buildings. The work of the department is done by some eighty inspectors, who decide on their own responsibility what application shall be made of the building-laws of New York. A fixed allowance of $75,000 is made for the expenses of the Department, so that any increase of expenditure in any one direction has to be met by cutting down in others. At the time of the appointment of the present incumbent, says the *Times*, his salary was $4,000, and the inspectors' $1,800 each. Before long, it continues, he contrived to have his own salary increased by sixty per cent, to accomplish which those of the inspectors were cut down to $1,500 each. This was soon followed by the levying of a tax of fifteen or twenty dollars on each of them at irregular intervals; a new reduction of pay to $1,200 followed, and these same assessments from time to time, alternating with other reductions, till in 1876 most of the inspectors received only from seven hundred and fifty to a thousand dollars. There is no account of a further increase of salary to the Superintendent; but the assessments accrued, says the *Times*, when he had notes to pay, or had occasion to make a journey to Albany on legislative business, the inspectors not daring to resist or complain for fear of losing their places, which were at the disposal of the Superintendent. Under these circumstances the inspectors are ready, it is charged, to eke out salaries on which they cannot support their families, and are always open to bribery; and the consequence is that violations of the building-laws are everywhere connived at, to the demoralization of the Department of Buildings, and the constant danger of the public.

MEANWHILE in Boston the old chief inspector of buildings has been replaced under circumstances that have been very distasteful to a good part of the community. Some time ago, when there was question of his removal on what seemed to be purely political grounds, an earnest remonstrance was signed by most of the architects of the city, and by the principal builders, and at that time the change was not made. Soon after came the fall of the staging at the dedication of the Soldiers' Monument; and his responsibility for that has been assigned as the reason why he is now replaced. It does not become those who believe in the necessity of enforcing strict responsibility in such an important office to complain of this piece of discipline, if it is only borne out by such rigor in the future control of the inspectorship, as shall show that it was inflicted in good faith. We have not heard, however, of any thing being done to the sub-inspectors to whom the direct responsibility of inspecting the stand which fell had been deputed. The new inspector has been appointed in face of strong opposition, and against an earnest remonstrance from many architects and builders. He is neither architect nor engineer, nor a builder of reputation; and there is no reason to suppose that he has any thing more than an ordinary contractor's knowledge of building. He has experience in the management of fires, for he was chief engineer of the fire department in Boston for some years, up to the time of the great fire of 1872; but complaint was made that his chief strength lay in the management of city politics, and after the experience of the fire it was thought necessary to re-organize the fire department, putting it in the hands of special commissioners; and the former chief engineer disappeared from view. Under these circumstances, the presumption against the new inspector is strong, and lays on him an unusual obligation to justify his appointment. The requirements of such a position have changed much of late. An ordinary knowledge of building will not meet them; nor will an easy-going routine performance of duties. The inspector is constantly called on to face difficult questions with knowledge and decision; to enforce his authority against embarrassing opposition and many temptations. The public demand for accountability grows with the importance of the position. A man who owes his place to a severe enforcement of such accountability upon his predecessor, has need to show by his administration a fitness for it that cannot be gainsaid; and the authority that has appointed him against a common distrust, has given large hostages to the public.

THE public at all events are not left to forget the need of inspectors or the importance of their duties. The burning of the great warehouse of Field, Leiter, & Co. in Chicago, last week, by which half a dozen firemen were killed and several more badly hurt, is another warning. In this case the building was so high that water could not be thrown upon the roof, where the fire took; and the flames made their way down through the large central well and among the wooden flues so fast that the burning staircase fell upon the men. The roof, which was a wooden mansard, had taken fire once before, and had been put out with great difficulty—the fire each time beginning within the furring over the attic ceiling, where it was very difficult to get at. There is a touch of what some persons would call the "irony of fate" in the burning of Candee's rubber-factory at New Haven, where the fire-officers were actually inspecting the extinguishing apparatus at the moment when the fire broke out, and were very nearly burned up with it. As we write it is still uncertain whether any of the work-people were burned, though it is said that some were injured. But for the fact that five hundred out of eight hundred girls had just been discharged for want of work, the disaster might have been greater, for the fire, as in the Chicago building, spread with wonderful quickness.

AT the time we write there seems no doubt that the Paris Exhibition bill will go through Congress substantially as we reported it in our last number. In the text of the bill as passed by the House, we find no trace of the unexplained special provision for the re-exhibited goods which we then doubted, and we are glad to know that the Indian corn amendment which was at one time attached to it will not be tained. It has been replaced by some very foolish amendments whose object is to share the commissioners alike among the States, balancing New York and Pennsylvania against Florida and Texas, for instance, without regard to the number

of specially qualified men they may have to offer, and so probably depriving the country of much-valuable service. It seems a thing to be regretted, that the appropriation asked for by the Secretary of State is considerably reduced. As he well said, "The meagre contribution which we furnished to the Vienna Exposition can furnish no safe measure of the greatly increased transportation we shall need to meet the wishes and expectations of our people in the representation of their interests at the French Exposition." Economical administration of the government is very praiseworthy, and just now very opportune; but if judicious economy, as is commonly understood, consists in knowing just where to save and where to spend, it consists in distinguishing what should be cut off altogether and what needs to be done well if at all. Among these last things we should include an important undertaking which we share with foreign nations.

A SCHEME of internal improvement which was devised some forty years ago is likely to be pressed upon Congress this winter, says the *Philadelphia Press*. It is a scheme for a land-locked water communication along and near the Atlantic coast from Florida to New York. The chain of salt water reaches and sounds, which stretches almost uninterruptedly along the coast of North and South Carolina and Georgia, has always suggested tempting prospects of an easy coastwise traffic, sheltered from the gales that make a terror of the neighboring Atlantic in this region; but the shallowness of much of the water, and the interposition here and there of stretches of open coast, have made such a route unsafe for inland craft and impracticable for sea-going vessels. There is already in use, however, a continuous water-route, for steam-barges and the like, from New York to Pamlico Sound. Boats enter the Raritan River from New York Bay, and pass through the Delaware and Raritan Canal to the Delaware River, which they follow to the head of its bay, then crossing by the Delaware and Chesapeake Canal to the head of Chesapeake Bay, descending its whole length to Norfolk. Thence the Chesapeake and Albemarle Canal, taking in part of Currituck Sound, brings them into Albemarle and Pamlico Sounds, and so by the Neuse River to Newbern. Now it is proposed to ask the Government to extend the route as far as Wilmington, by a canal between the Neuse and Cape Fear Rivers, and to deepen the channels from Norfolk till they will admit vessels of ten feet draft. A survey for a canal to Cape Fear River was made two years ago by Col. Abert of the United States Engineers, and reported to Congress last winter. Two estimates were submitted, — one for a canal at the sea-level at a cost of something over seven and a half millions of dollars, the other for a summit-level canal with six locks, at a cost of about four millions. This project derives its importance, as Col. Abert said in his report, "from being part of a general scheme for uniting the sounds which extend from Fernandina, Fla. (with but few interruptions), to North Carolina, and complete the connection by means of the intervening lakes with the northern lakes and the St. Lawrence River." He adds that the construction of the Cape Fear Canal, which is less than sixty miles, and of two sections south of it about a hundred miles in joint length, will make a continuous communication by canal, sound, and river from the St. Lawrence to Fernandina. That such a line of communication would prove in the long run a great convenience to coastwise trade can hardly be doubted, when we consider the dangers of the outside route; and if our coast-defence in time of war is to consist in monitors, torpedoes, and other unseaworthy machines, it might become of great military importance. Of its immediate urgency we cannot judge; but it is hardly to be expected that a House of Representatives which is bent upon cutting down the army should look with favor upon it for military reasons.

A CORRESPONDENT sends us a letter which we print on another page, complaining, and with reason, of the common neglect of bonding in American brick-work. It is clear enough that our fashion of building brick walls in vertical slices of four inches thick, held together by little else than the layers of mortar between them, is a very insecure one. Even the pretence of bonding by headers in every fifth course is more honored in the breach than the observance, especially when the work is meant to be handsome; and the facing of a wall is commonly held to the backing only by withes of hoop-iron or something of the sort, or by mere adhesion. The reason is plain. It is to get a sleek surface by the use of a quality of brick and workmanship which is not to be carried through. This is the case both with good masons and bad. The first often, from a notion that the characteristics of handsome brick-work are a sleek face and thin joints, wish to lay the outside with smooth face-brick that will not bond with the backing because of difference in size, and which it would be an unreasonable expense to carry through the wall. It is nothing unusual, in fact, where a brick building is under alteration, to see the whole facing skinned off, leaving the rest of the wall undisturbed, to be replaced by one more ornate. There is of course no greater objection to this kind of construction than there is to building a veneering of thin stone without bonding it into the wall, provided the wall itself is given its due thickness and bond independently of the facing. But though this is provided for in the case of stone veneering in some of our building-laws, we remember none in which the brick facing of a brick wall is counted out in estimating its thickness. The tendency is, in order to save trouble, to build the backing in the same disconnected way, and make a wall that can be split into slices from top to bottom. In the hands of a scamping builder this makes as bad brick-work as one can conceive. Though the difference in scale between face brick and common brick is one of the greatest drawbacks to a good system of bonding, it is one that could readily be removed. With it conspires the rage for thin joints, which are quite incompatible with thorough bonding, except with bricks that exactly match, and in the most laborious manner. And yet thin joints are not necessary to nice workmanship. We say nothing of Roman brick-work, which was meant to last and not to show; but the wide joints of a handsome piece of French or German brick-work would to a good American bricklayer be a stumbling-block, and yet the foreign work is in no wise inferior in mechanical beauty to ours. So long as there was nothing in our brick masonry but its joints wherein its workmanship could be shown, it was natural to like to make them as close as possible. Now that ornamental brick-work, with colors and moulded forms, is coming into vogue, our workmen will find other ways of showing their skill, and can afford to forgive a wider joint if it is a good one. The most insidious foe — and we fear the most obstinate one — to a solider way of bonding is likely to be the desire for cheap work.

THE CHURCH ARCHITECTURE THAT WE NEED.[1] — I.

THE necessity which man experiences to address the superhuman has induced all races to erect shrines and temples to the Infinite. Religious architecture, therefore, is the first to develop itself, and it may be safely asserted that the human race has lavished more time and treasure upon the erection of religious edifices than upon any other class of structures. In the religious monuments of antiquity, particularly, we find embodied the spirit of past ages, and in order more clearly to arrive at our present requirements, it may be meet to first glance at the church architecture of the past. The early Christians who, until the fourth century, were condemned to worship God in secret places, were first enabled to celebrate their religious rites openly after the conversion of the Emperor Constantine to the Christian faith. The pagan temple with its cella, where only the priesthood and the initiated were allowed to penetrate, was ill-suited to the requirements of the followers of Christ, who were called upon to take part in the worship of God, and on that account, if for no other reason, was discarded by them. The spacious basilica, on the other hand (where justice was administered, and which served also as an exchange and place of public meeting), was well adapted to their wants, and was naturally adopted by them, and has since served very generally, with certain modifications, as the typical church throughout Western Europe up to the present day.

Vestiges only of the Pagan basilicas of Rome have been handed down to us; but sufficient data exist to form some idea of the grandeur and magnificence of two of the most important ones of that imperial city, namely, that of Trajan and that of Maxentius, respectively 180 feet and 195 feet wide, and proportionately long. The interior space of the former was subdivided by four rows of columns into five avenues. The central one or *nave*, 87 feet wide and about 120 feet high, was covered by a semi-circular wooden roof, apparently covered with plates of bronze and richly decorated. Galleries extended above the side aisles, the columns of which supported the roof, and the interior was lighted by windows

[1] A paper read at the Fourth Church Congress held at New York from Oct. 30 to Nov. 2, by Mr. Richard M. Hunt, F.A.I.A.

in the side walls. In the Basilica of Maxentius, commonly known as the Temple of Peace, four piers of masonry separated the main nave from the side aisles. The nave, 83 feet wide and 120 feet high, was covered by groined arches; the side aisles, each subdivided into three compartments, were covered by barrel vaults of 72 feet span, running at right angles to the main aisle, the crown of the side vaults rising to about the level of the spring of the middle vault, thus allowing space above for large window openings which lighted the upper and central portion; other windows in the side walls lighted the aisles. This latter system of construction, for many reasons, was not followed by the early Christians, but was revived during the Middle Ages. For centuries the cheaper and more easily constructed basilica, with its wooden roof supported on columns abundantly furnished by the pagan monuments, was the type adhered to; and great solidity and economy were thereby obtained. Ten centuries of existence is the proof of their solidity; and economy was gained by the lightness of the construction generally, no vaulting being introduced necessitating heavy supports, the apse alone being vaulted.

The architectural details of the most ancient Christian basilicas furnish conclusive evidence that they were erected for the express service of that faith; and on account of their great similarity in plain and detail to their pagan prototypes, the appellation *basilica*, signifying "Royal House," was naturally retained, and it is even probable that the arrangement of the structure influenced to some extent the usages adopted by the early Christians. The early Christian basilica was rectangular in plan, about twice its width in height, and generally subdivided interiorly into three aisles by two rows of columns running lengthwise of the building. The middle aisle or nave was about double the side aisles in width and height, and was covered by a double pitched wooden roof, either ceiled in below or showing apparent timber work, the aisles being covered by lean-to roofs. The interior was amply lighted by circular-headed windows, both in the outer walls of the aisles and in the upper portion of the nave, — the clere-story. In more important churches the side aisles were doubled; galleries were also introduced at times above them. The main entrance was located in the middle of one end of the building, with minor entrances on either side. An atrium for the assemblages of the penitents (recalling the ancient forum) usually preceded the entrance, in the centre of which stood a fountain where the faithful sprinkled themselves in token of inner purification. Later the narthex or porch replaced the atrium, and the basin of holy water placed inside the building near the entrance was substituted for the fountain. At the end opposite to the entrance was the apse, corresponding to the tribune of the ancients, semi-circular in form, and raised a few steps above the general level, while in the middle of the apse, instead of the seat of the chief magistrate, the bishop's throne was placed with seats for the inferior clergy on either side. In front stood the altar, with a canopy supported on four columns (the ciborium), which could be closed by curtains; and originally the priest, when officiating at the altar, faced the congregation. In order to separate the clergy from the laity, the apse was at first railed in; later, more room being required for their accommodation, a space in front of the apse was likewise enclosed — styled the bema or presbytery; and still later the choir, with the ambo or pulpit, where the Gospels and Epistles were read and services performed by the inferior orders of the clergy, occupied a portion of the nave, adjoining and in front of the bema. The enclosure of the choir was kept low in order that the congregation might witness the ceremonies performed in the raised presbytery.

The architectural treatment of the early Christian basilicas was simple and severe. Exteriorly, no attempt at architectural effect was made except in the treatment of the principal façade, the crowning feature of which was its coved cornice, with stucco and painted decoration or mosaic work. The sides of the building presented bare walls, pierced with round-headed windows and crowned by a cornice. The interior, with its rows of polished granite or marble shafts, offered a grand opportunity for producing a truly magnificent effect; and in spite of the incongruous mixture of fragments taken from heathen buildings, the effect produced was imposing and solemn. Simplicity and repose reigned throughout, and the great wall spaces, decorated with frescos representing sacred subjects, which were treated in a broad and dignified manner, gave to the interior an air of solemnity which the rich mosaic decorations (generally on a gold ground) of the apse and about the grand opening of the nave into the sanctuary, styled the Triumphal Arch, greatly enhanced. And to this day the Roman basilica, with its nave 80 feet in width (about double that of most Gothic cathedrals), stands unrivalled for great breadth of effect indicative of stability and power. The absence of a vaulted ceiling (necessitated by the great width) renders it perhaps less monumental than the cathedral; still its unbroken colonnades, leading to the triumphal arch and the apse beyond, concentrate the interest about the altar to a much greater degree than where the principal feature occurs at the crossing near the middle of the nave.

St. Paul's, outside the walls of Rome (rebuilt in 1822), is very similar to the original basilica of St. Peter's, erected by Constantine, both in arrangement and dimension, and in its majestic splendor furnishes a good example of the five-aisled basilicas; while the magnificent interior of Santa Maria Maggiore offers a most beautiful example of the three-aisled basilica, with its noble colonnades supporting the clere-story and panelled ceiling above. San Clemente, however, erected in the fourth and fifth centuries and rebuilt in the tenth, is by far the most interesting, as being in many respects the most complete example now extant of this early type.

In order more clearly to appreciate the changes occurring in church architecture, it is necessary to consider another type coeval with the basilica, which was destined (through Eastern influences) to develop into a new style, — the Byzantine; which influenced very appreciably the Romanesque architecture — that derived from the Roman — of Western Europe. In the earliest days of Christianity, the circular church was quite as common as the basilica (rectangular in plan), especially where a building of moderate dimensions was needed. During the eleventh and twelfth centuries, however (when so many churches were rebuilt and enlarged), the circular form was superseded almost entirely by the basilica, the latter being better adapted to the extended requirements of Christianity. The basilica became the "ecclesia," or place of assembly, of the early Christians. Matters of importance, civil and religious, transpired within its walls. The circular building was used for the celebration of the more sacred rites of the church, and usually stood by itself near the west end of the basilica. Originally (like its Roman prototype) it contained the tomb of some important personage; and from the fact that the rite of baptism was there administered, it was called the "baptistery."

The early Christian circular buildings were generally covered by wooden roofs, and the interior subdivided by one or more concentric rows of columns forming circular aisles. The central portion (like the nave of the basilica) rising above the aisles was lighted by clere-story windows. Among other examples of this type are San Stephano Rotondo and the Baptistery of Constantine. In the tombs of St. Helena and those that stood in the spina of the Circus of Nero, the wooden roof is replaced by the dome (first applied by the ancient Romans in structures of importance). It is more than probable that the basilica was the type of the Christian churches erected in Byzantium by Constantine (322); but this type was soon abandoned, as under Justinian, two centuries later, the Church of St, Sophia (originally erected by Constantine) having been destroyed by fire, was rebuilt on a totally different plan, and offers to-day, with its pendentive dome resting on four corner piers, the grandest specimen of Byzantine architecture. With the introduction of this novel feature, *the pendentive* (which consists in filling the voids in the angles occurring between the square and the inscribed circle with spherical triangles of masonry), the problem which had puzzled the architectural mind for centuries, namely, the satisfactory combination of the circular dome with a square substructure, was solved, and most important was the result. Among other interesting examples illustrating the various stages of this combination of the dome with the octagon and the square, may be cited St. Vitale at Ravenna, which served as a model to the tomb of Charlemagne at Aix-la-Chapelle; San Lorenzo at Milan, the cathedral church of that city down to the eighth century; Sta. Fosca at Torcello, Venice; and the Church of Sergius and Bacchus, known as the lesser St. Sophia, in Constantinople.

A few words are necessary in explanation of the vast importance of this new feature, the pendentive. The dome of the ancient Romans resting on a drum was truly grand in its simplicity. That glorious example, the Pantheon at Rome, 144 feet in diameter and height, uniquely lighted at the top, rivals in sublimity of interior effect any thing since accomplished in Western Europe. Exteriorly, however, great difficulties presented themselves whenever any attempt was made to combine the circular form harmoniously with any adjunct or addition; and besides, with the increased size of the building (the interior being practically confined to the space occupied by the dome), the weight and thrust of the latter were increased, and difficulties of construction arose. By the employment of pendentives (the dome being supported at four points only), the difficulties previously encountered in extending the building beyond the dome disappeared.

Eastern Europe abounds in examples of this striking feature introduced in an endless variety of ways, securing advantages of plan, and which are universally graceful in outline. The Church of St. Sophia, so often reproduced in the mosques of Constantinople and the East, offers an interior which for beauty and appropriate design and sublimity of effect stands unrivalled. This church is nearly square in plan, it being 220 feet wide by 243 feet in length. The central dome, 107 feet in diameter and 182 feet high, rests on four semi-circular arches. Supported on corner piers abutting against these arches on two sides are semi-domes, around which are clustered other smaller ones. On the two remaining sides the arches are filled in by a wall pierced by three tiers of windows, below which are galleries two stories in height, which extend around the entire church excepting at the apse. The galleries are well lighted by side windows. At the end opposite the apse there is also a large window directly lighting the middle portion of the church, in addition to which a girdle of windows is introduced at the base of the domes, which diffuse a mysterious light, making the domes appear as if they were suspended from on high, and increasing the effect of the rich mosaics

(with their gold background) lining the domes and covering the upper portions of the walls, in perfect harmony with the variegated marbles which embellish the walls below.

Another type of the Byzantine church (and one with which we are all familiar) is that of St. Mark's in Venice, 164 feet by 205 feet. The ground-plan is in the form of a Greek cross. Five equal-sized domes, resting on arches extending back to the walls, surmount the arms and the crossing. Rows of columns between the supporting piers which separate the nave from the aisles are here introduced, probably to increase the apparent height of the nave, as there are no galleries above the aisles. The interior is profusely decorated with marbles and mosaics in the same manner as, though far inferior to that of St. Sophia, and justly commands our admiration. A great variety of marbles are also used in the interior decoration. Originally the roof covering was laid directly on the extrados of the domes, as at St. Sophia and throughout the East; the canopies which now surmount them being erected in the fourteenth century.

St. Front, at Perigueux, France (erected on the site of a Roman basilica), is almost an exact repetition in form and dimension of St. Mark's. Instead, however, of the semi-circular arches and domes used at St. Mark's, we find the pointed arch and dome, which were probably employed to diminish the thrust, — a fact worthy of remark, as at that time, in the tenth century, the pointed arch had not yet been adopted in France. Later, during the eleventh and twelfth centuries, numerous examples occur in various parts of France, where the pendentive dome is introduced in churches, both with and without transepts. Before returning, however, to the church architecture of Western Europe, it may be well to note some of the characteristics of the Byzantine style.

With the introduction of the pendentive dome, a vast unencumbered space was obtained, without the great height which the vaulted ceilings of the Gothic and Romanesque styles necessitated. The great breadth of effect of the vast wall surfaces, richly decorated with mosaics and marbles, was increased by the skilful treatment of the details throughout; the smaller parts contrasting with the larger, so as to increase the apparent size of the structure, or, in professional parlance, the "scale" of the building was augmented, which method was employed later by the Gothic architects with much effect, and which was diametrically opposed to that followed in the classic school, where the proportion of the orders or *ensemble* governed the details in every part.

Already in the eighth century, during the reign of Charlemagne, the Romanesque churches bore the stamp of oriental influences, especially along the Rhine, the Mediterranean coast, and in the Pyrenees. Through these influences, and various others, many modifications were introduced from time to time in the basilica, which still remained the chief type of church architecture in the West of Europe. Among other changes are to be noted the introduction of additional chapels beside the apse; the total omission of the apse (the last end having a rectangular termination); the introduction of a second apse, with choir at the west end, together with a second transept at times; the continuation of the aisles around the choir and apse, with or without chapels — an important feature admirably worked out later, especially by the French in their chevets, where the lower portion of the wall of the apse is replaced by columns, producing a wonderful effect in perspective, and which originated in the attempts made to join on to the east end of the nave, a circular building containing the tomb or relic of some saint, the gradual development of which is to be traced in the plan of St. Benigne at Dijon, destroyed during the French Revolution, in the Church of Charroux, on the Loire; that of St. Martin at Tours, and those of Conques and Toulouse.

Quite as important as these interior modifications, were the changes introduced in the exterior façades. The side walls were subdivided into compartments by pilastered buttresses and engaged columns. Small arches were introduced in the cornices, and galleries of arches on columns around the apse; varied and beautiful polychromatic effects were also obtained by the use of different colored materials. Columns were also used at the sides of the doors and windows, the latter being now grouped together. The western façade especially assumed great importance, with its two towers and central gable, or horizontal front, or with its central tower.

Towers were also introduced to flank the façades of the transepts, which were carried to the same height as the nave; and at the crossing the lantern tower was introduced, thus accentuating in elevation the form of the cross in plan. The most important change, however, resulted from the substitution of the vault for the wooden ceiling (which, previous to the tenth century, was only used over the choir and apse). This change originated probably in the desire to protect the structure from the dangers of the elements, as in the earlier examples the roof covering of stone, lead, or metal, was laid not unfrequently directly on the extrados of the vault; but on account of dampness and for other causes, this method had to be abandoned, and a wooden roof with slate, tiles, or metal, constructed as a protection to the masonry. The circular church at Nocera dei Pagani, between Rome and Naples, offers the earliest instance known of covering the vault of a building with a wooden roof.

The varied attempts at vaulting the nave were but partially successful, however, on account of the great difficulties experienced in overcoming the thrust of the old Roman barrel vault then employed, it being accomplished by the construction of semi-vaults over the aisles, and by leaving out the clerestory. Later, buttresses were introduced with groined arches, but it was not until the Roman system of vault-building was superseded by the Gothic system in the twelfth and thirteenth centuries, that this important problem was solved satisfactorily.

THE ILLUSTRATIONS.

THE CATHEDRAL AT WORMS.

ONE of the oldest as well as most instructive of the German churches is the cathedral at Worms, built in the Romanesque style. It was begun in 996 upon the site of a much earlier church, and was consecrated in 1016, or according to other authorities, in 1110. As will be seen by examining the plan, this is one of the buildings in which the form of the Latin cross is most strongly marked. Like the cathedral at Spires, which was built at about the same time, but which has retained more of the Roman basilica in its appearance, for most of the German and French churches were then modelled on the plan of the Roman basilicas, this building is remarkable in its four towers (two at either end) and two domes. The cathedral at Spires, however, has entrances at the west end as well as on the sides, whereas this building can be entered on the sides only, — a peculiarity of arrangement which it shares with a number of the more important German churches, as for instance the cathedrals at Bamberg, Mainz (Mayence), Augsberg, and Trier (Treves), the abbey church at Laach, a church at Hildesheim and St. Sebald at Nürnberg. This arrangement allows of a sort of secondary choir at the west end, which is here terminated by an octagonal apse. This portion of the building is of later date than the rest, for here are found pointed arches, and may possibly have been built in 1300 at the same time with the south portal. The north-west tower was built in 1472, to replace one that had fallen. The building measures on the inside about three hundred and fifty-seven feet in length by eighty-seven in width. Engaged columns on the inner sides of the alternate piers of the nave receive the ribs of the vaulting, while every pier has an engaged column on the side towards the aisles. The air of dignified simplicity which is the characteristic of the interior is broken at the choir at the east end, which in the eighteenth century was decorated with marbles and gilding. The illustration is reproduced from Dollinger's *Architectonische Reise-Scizzen*, published at Stuttgart by Konrad Wittwer.

INTERIORS OF THE COUNCIL-CHAMBER AND MAYOR'S CHAMBER IN THE CITY HALL, PROVIDENCE, R.I. MR. S. J. F. THAYER, ARCHITECT.

The plans of this building, together with a view of the central hall and staircase, were published in our number for March 25, 1876.

HOUSE OF W. H. HUNTINGTON, ESQ., CLEVELAND, O. MR. F. S. BARNUM, ARCHITECT.

This house is very substantially built, and for one of its class and cost very complete in its appointments. The hall or reception-room forming an important feature of the interior has stairs entirely of hard wood, as also an open fire-place faced with tiles, with tile hearth, and a high mantel in one angle as shown on the plan. The projecting window on the stairway has a transom filled with stained cathedral glass. The exterior is painted a pale green, with trimmings in olive green; the roof covered with red tiles. The cost complete is $4,500; this includes electric bells and burglar-alarm throughout.

HOUSE OF H. D. LLOYD, ESQ., CHICAGO, ILL. MESSRS. BURNHAM AND ROOT, ARCHITECTS.

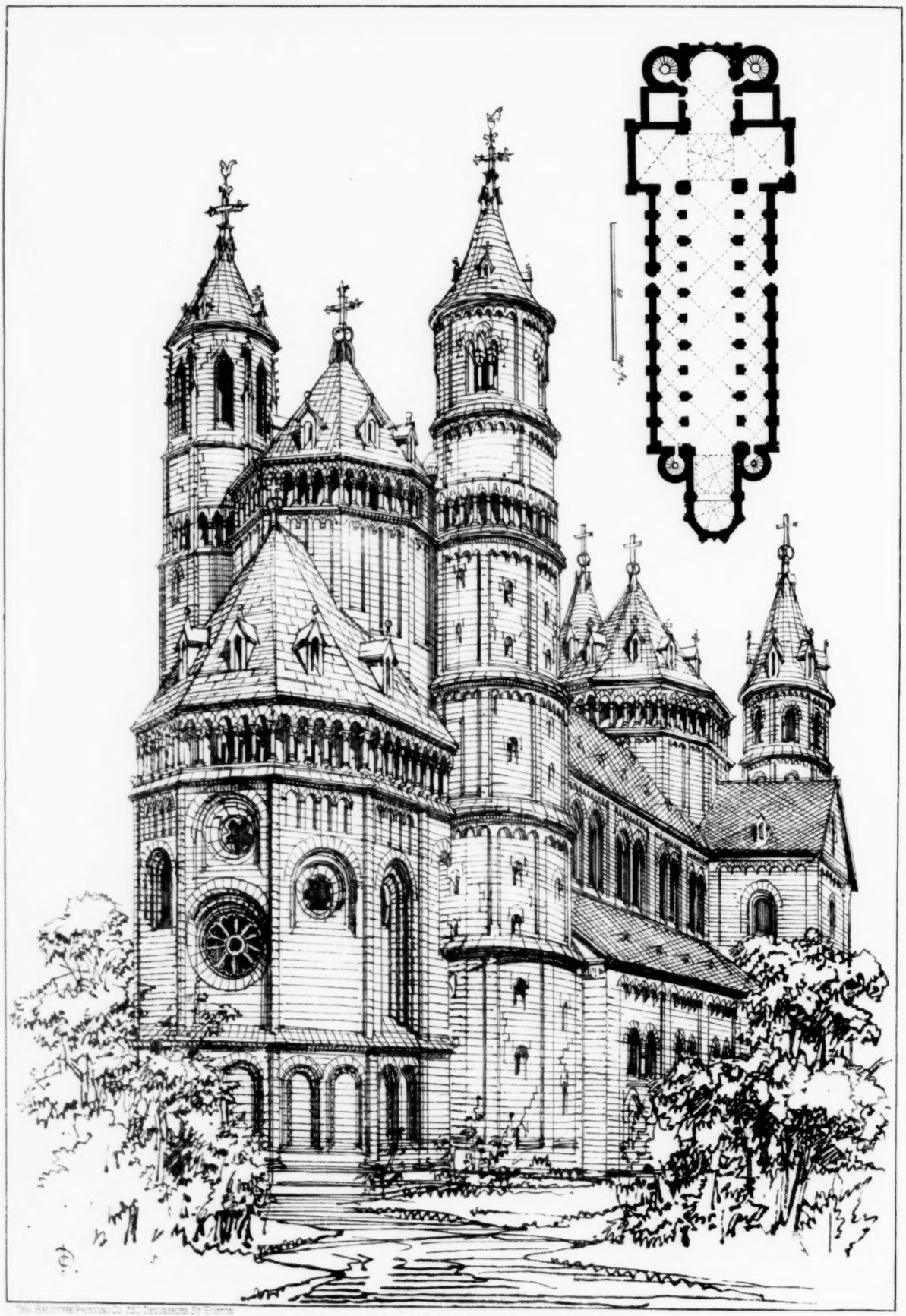
This house, which was built in 1875, is of Philadelphia brick with wrought work of Lemont stone. The interior finish is of yellow pine oiled and shellacked. The ceilings are of timber and plaster.

VILLA NEAR PHILADELPHIA, PENN. MR. T. RONEY WILLIAMSON, ARCHITECT.

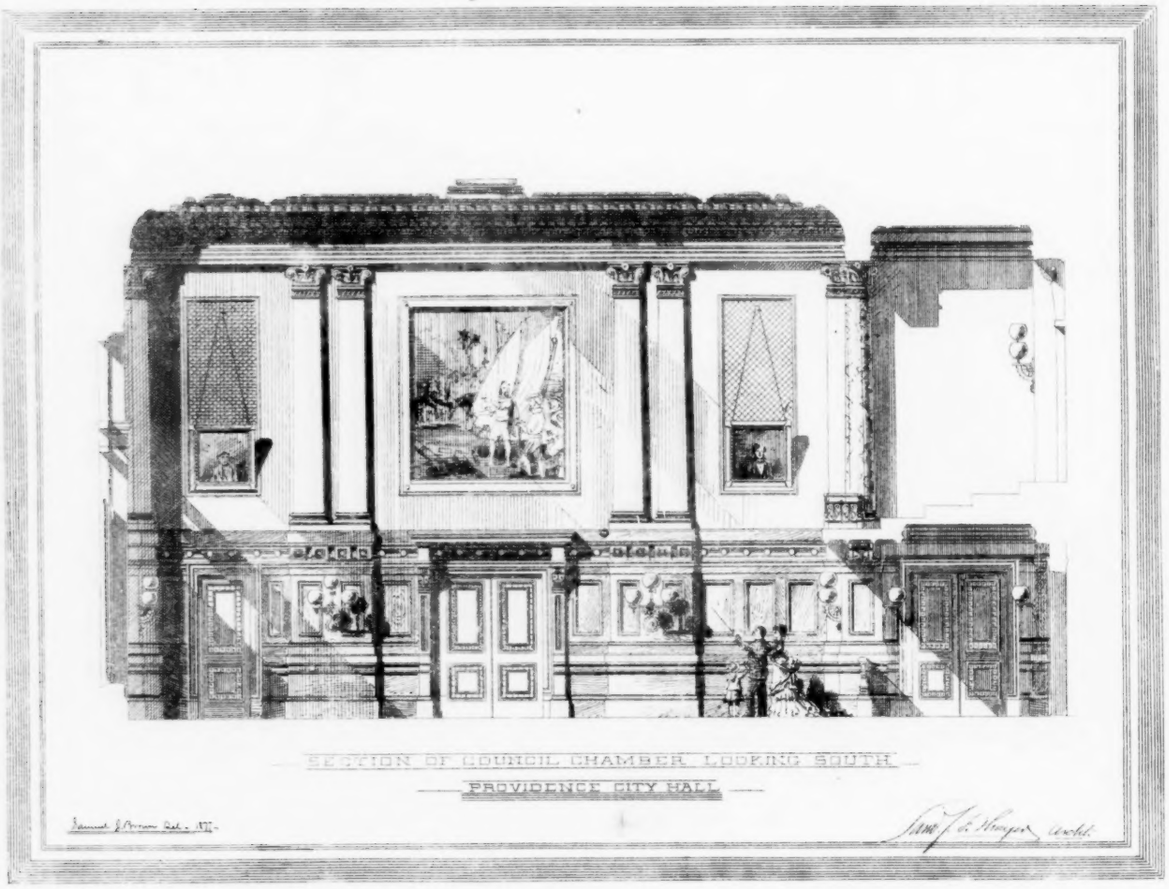
This drawing represents a small half-timber house at Angora, near Philadelphia. The first story is of Philadelphia brick laid in black mortar. The second story is a timber frame with the panels filled with plaster.

A NOTABLE ARCHITECTURAL JOURNEY.

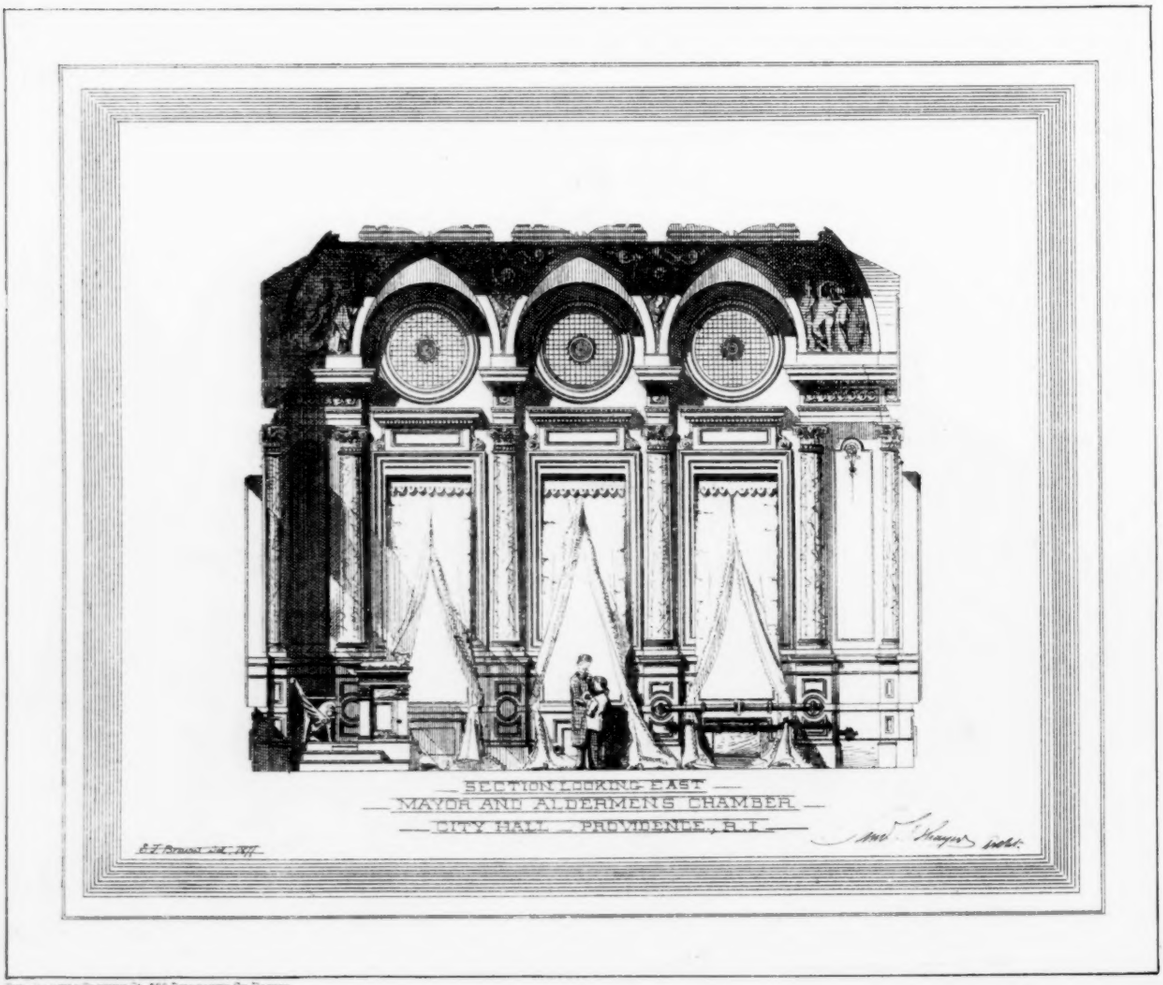
IN our notice of Dr. Freeman's Historical and Architectural Sketches (vol. ii., p. 19), we had occasion to state that he is the only English writer of general history who has given due weight to the testimony of architecture. Approaching this art from the historical side, and bringing to the subject an intelligent appreciation of the significance of form, especially as regards the growth of distinctive styles, the recurrence of especial features in buildings far apart from each other, and the characteristic variations



CATHEDRAL AT WORMS



SECTION OF COUNCIL CHAMBER LOOKING SOUTH
PROVIDENCE CITY HALL

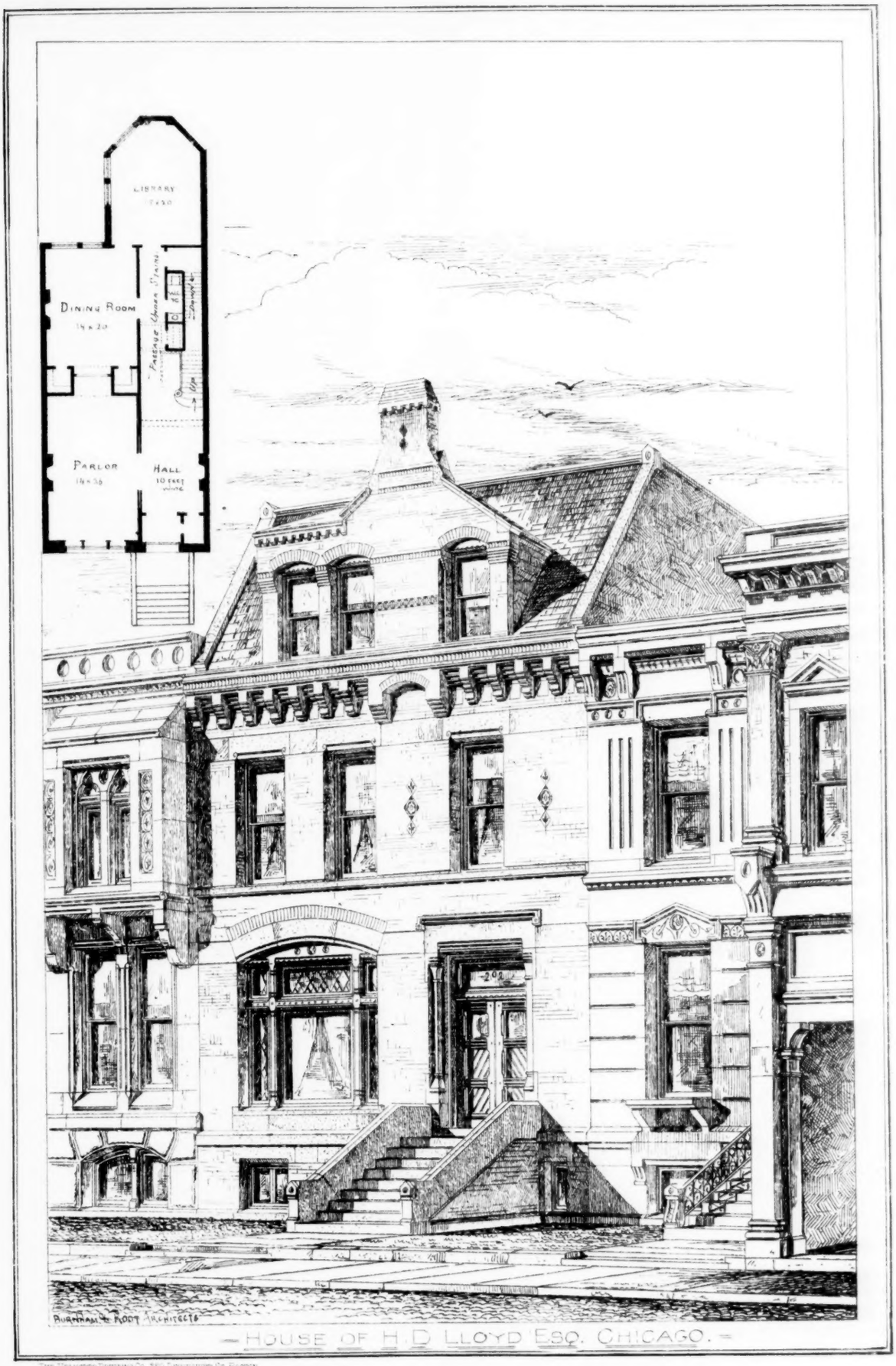


SECTION LOOKING EAST
MAYOR AND ALDERMEN'S CHAMBER
CITY HALL PROVIDENCE, R.I.

THE HELIOTYPE PRINTING CO. 330 DEVONSHIRE ST. BOSTON

RESIDENCE OF W. H. HUNTINGTON, ESQ. - CLEVELAND, O.
- F. S. BARNUM, ARCHITECT -

THE HELIOTYPE PRINTING CO. 330 DEVONSHIRE ST. BOSTON



HOUSE OF H. D. LLOYD ESQ. CHICAGO.

THE HELIOTYPE PRINTING CO. 330 DEVONSHIRE ST. BOSTON

in certain details attributable to the unconscious influence of race and usage, he has been enabled not only to illustrate and enforce well-known historical facts, but by processes of deduction entirely new to historians, to show more clearly than heretofore, the mutual relations of countries, and the essential genius which underlies and induces the character of various civilizations. Probably also from architectural remains, the science of ethnology will ultimately obtain its most satisfactory testimony, and its most abundant and significant illustrations. Any attempt therefore to describe or analyze an ancient or contemporary architecture, if the examination goes below the external features of it, and explains how it developed or is developing out of the necessity of things, how it is an outgrowth, and, in a manner, an expression of religions, politics, and habits of life, is a contribution, not to architecture alone, nor to archæology; but to that greater science which addresses itself to the study of man, as a creature of intelligence and progress. Such attempts are unusual enough to make the architectural journey of M. Félix Narjoux in the north-west of Europe, as set forth in his "*Notes and Sketches*,"[1] worthy of special consideration.

Certain descriptive passages from this book, which we quoted in these pages in the early part of the year, with their illustrations, may have served to give some idea of the style of this author, both with pen and pencil, and to recall that of his friend and master M. Viollet-le-Duc. His journey extended over a part of Europe comparatively little travelled by foreigners. He sketched in Holland at Dordrecht, Rotterdam, the Hague, Scheveningen, Leyden, Haarlem, Amsterdam, Enknisen, and Utrecht; in Germany at Hanover, Hamburg, Altona, and Heligoland; and in Denmark at Copenhagen and Elsinore. His architectural studies include town-halls, churches, museums, railway-stations, hospitals, theatres, schools, and palaces, also certain works of military engineering; but the larger and by far the more interesting part of his book is devoted to domestic work, which is illustrated by plans, sections, and elevations of the dwellings of all classes in town and country, including furniture and interiors with their decorations. The professional reader will recognize in these drawings the unlabored manner, the correct architectural delineation, the graphic and effective style, of the school of Viollet-le Duc. The only parallel to the drawings of this school which we can recall, are the rare and famous etchings of Israel Sylvestre (1621–1691), who had the faculty of presenting the essential architectural characteristics of the buildings of his time with such truth and graphic force, that his drawings, even when occupying no more space than the area of a thumb-nail, contained in due proportion all the essential elements of individuality, in each case, recognizable not only by the picturesque outlines, which any skilful artist might seize, but by architectural details which demanded for their proper setting forth under such circumstances, the finest sympathy and most accurate technical knowledge.

In treating of each town, the author devotes considerable space to the manners and customs of the inhabitants of various grades, and undertakes to show how their dwellings have been adjusted to these special conditions in each case; also what modifications of style have been created by the characteristics of the building materials, what traditional forms still linger in each place, and how reluctantly among these domestic and isolated peoples these forms have yielded to the innovation of fashion and novelty. His eye is quick to detect in every plan those points which have a bearing upon the nature of domestic service, and which in any way reveal the habits of life among the occupants, and the nature and degree of their culture and refinement.

In these observations concerning domestic architecture, M. Narjoux seems to us to have made a more important and original contribution to our knowledge, than in those relating to the more monumental structures, although these latter with the illustrative drawings are among the best of their kind, and contain just such distinctive qualities of excellence with regard to essential points as we have a right to expect from an architect whose mind is trained to a nice appreciation of points of design or construction, and whose hand swiftly and accurately follows the just impression.

It is curious to observe, especially in the arrangement of the Dutch and Danish dwelling-houses of all grades, not only how essentially the local requirements of domestic life there vary from our own, but how, in a less marked but hardly less appreciable degree, those of one town differ from those of another, its neighbor. But they all indicate the possession, on the part of the people, of thrifty household virtues, economy and neatness, with love of ease, and dislike of ostentation. As regards the Dutch, our author says, "Especially they have dwelling-houses very well suited to their character, their tastes, and their wants: these are small, sombre, detached, all alike, perfectly neat within and without, divided into a limited number of rooms of considerable size, with a small garden, where they cultivate the flowers which they love so well; this affords the Dutchman the most complete satisfaction of his desires and aspirations. He is there alone and at peace, shut in, with no neighbors, no prying looks, no noise. These houses are as well adapted to their inhabitants, as the inhabitants themselves seem made for them." As a characteristic example of the method of M. Narjoux, we quote his account of a type of dwelling-house in Rotterdam: —

In order to satisfy these tastes and habits, which, as we have seen, must leave the mind and imagination perfectly calm, the Dutchman, who loves neither change nor variety, who can comprehend nothing but symmetry and monotony, who seeks neither society nor intercourse with his neighbor, constructs for himself dwellings arranged exactly on a uniform plan, with scarcely even a variation in size; the only difference which exists in the front of their houses is in the shape of the gables, which according to the period of their construction, and the taste of the day, are more or less strange; and nothing can in every case justify their grotesque forms. (Fig. 11.)

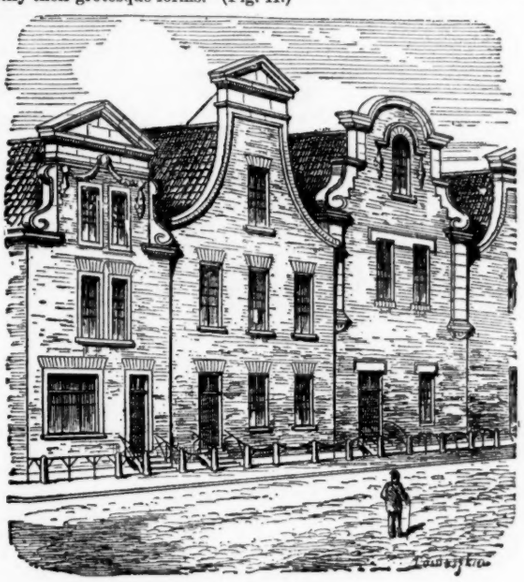


Fig. 11. — Houses at Rotterdam.

The ground-floor (Figs. 12, 13, 14) is composed of two rooms of equal dimensions, separated by a partition formed of panels, so as to slide upon each other by means of rollers, which renders it easy to throw both into one. Opposite to the street door is the staircase leading upward to the first floor, and downward to the basement, where are the kitchen, the room for coal or peat, the cellars, a bath-room, and closets.

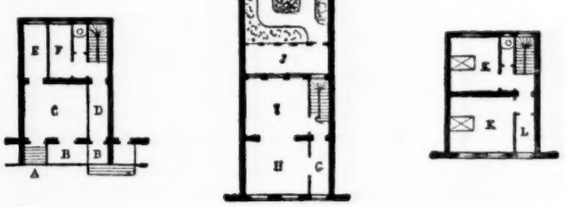


Fig. 12. — Basement.

A. — Kitchen Entrance.
B. — Area.
C. — Kitchen.
D. — Coal-hole.

Fig. 13. — Ground-floor.

E. — Wine-cellar.
F. — Bath-room.
G. — Hall.
H. — Drawing-room.

Fig. 14. — First-floor.

I. — Dining-room.
J. — Green-house.
K. — Bed-rooms.
L. — Dressing-room.

There is direct access to this underground portion from without, and in order to give all the light and air possible, an area of from 3 feet 3 inches to 5 feet wide separates the front wall from the public way, and keeps the passer-by at a distance. The upper story comprises two apartments similar to those on the ground floor, a dressing-room over the hall, and a closet. If the house is of greater importance, there is another story or even two or three above it, but the latter case is very rare. The attics are used for stores, and in order to avoid any thing being carried up or down the staircase, a pole with a pulley attached is fixed on the outside, by which all packages can be raised or let down.

As for Hanover and Hamburg, although their position in commerce has made them more cosmopolitan, and although they affect English forms more or less in their later works, which therefore have less of novelty to us, yet the domestic characteristics do not fail to give a mark of strong individuality to the arrangement of their dwellings; of the interior decoration and furniture of these, our author has much to say. In the latter, according to the drawings, the principles of Gothic construction are carried out with a fidelity which would commend it to the disciples of Eastlake, although it might prove to them that there are good things of this sort which do not come from England.

[1] Notes and Sketches of an Architect, taken during a Journey in the North-west of Europe. Translated from the French of Félix Narjoux, by John Peto. Author's edition from advance sheets, with 211 Illustrations. Boston: J. R. Osgood and Co., 1877.

The street architecture of Hanover is profusely illustrated, but a marked partiality is given to the works of his friend M. Oppler. Indeed, with the exception of M. Cuypers, at Amsterdam, this architect is the only member of the profession who is honored by name in this book — an omission the more to be regretted, as it seems to supply an excuse to non-professional writers for continuing to treat works of architecture rather as a nameless growth than the production of artists with inspirations like those of sculptors and painters, whose names and titles are carefully set down in the catalogues, and cherished as a necessary possession by all who pretend to have a knowledge of art

The book seems fairly translated, although in the descriptions of the plans there appears an occasional want of conformity, if not of intelligibility, which should be attributed, we presume, to a misunderstanding of the original text. The book is well presented by the publishers, and is notable not only for the qualities which we have indicated, but for presenting in its 214 woodcuts an array of fresh architectural *motifs* which the professional mind will be prompt to appreciate. The text, however, so far as it relates to Germany at least, is disfigured by a grotesque exhibition of the national dislike to the Germans and all that belongs to them. But the impartial eye, reading between the lines, can readily discover the sound architectural sense, which, after all, is the distinguishing quality of the book.

A similar journey through our own land by a foreigner equally well equipped would, if set forth in equal style to this, be of great service to us and to art; and, as an enterprise, might meet with great rewards. We would venture to commend it especially to the consideration of Frenchmen.

CORRESPONDENCE.

PUBLIC BUILDINGS IN BROOKLYN. — PLANS FOR THE NEW JAIL. — CHARGES OF BRIBERY. — THE LONG ISLAND HISTORICAL SOCIETY'S BUILDING.

NEW YORK.

THE city of Brooklyn seems as a municipality to be architecturally unlucky, considering its position as the third city in point of population in the Union, its public buildings being worthy of a backwoods town. The culture, learning, and taste of the citizens find no expression, and meet no response in the edifices where the public business is transacted. A Municipal Building has recently been completed, and however severe I may have been in speaking of the manner in which the work was entered upon, it was not too strong for the paltry conclusion reached. A poor and showy façade is topped out by a riot of metal cornices, pavilions, and French-roof dormers. The result was natural, and came directly from the work of a set of greedy political city-fathers, each coming to the selection of a plan as the retained representative of some plan-maker. A compromise ostensibly over two designs, but really a division of the fees and pickings, gave the "job" to two of the clamorous applicants; and Brooklyn is blessed with a concrete architectural nightmare.

Just now a quarrel is in progress in the Board of Supervisors over the choice of an architect to carry out the erection of a new jail for which $300,000 are to be expended. A committee on the jail was appointed, and Mr. William A. Mundell was requested to prepare plans and specifications, which he did; and a day or two ago the Board received the plans, and proceeded to discuss the employment of an architect in a manner which must have been torture to Mr. Mundell if he is not hardened by experience; while for an exhibition of what crude notions men holding responsible positions have of the work of architects, and by what standards they should be judged, the discussion was unique. The committee recommended that the plans presented be adopted, and the architect employed at the usual five per cent commission; and, to have the members vote intelligently, moved a recess of thirty minutes for the examination of the plans — which was certainly liberal, considering the block plan is 225' x 325', and the details rather elaborate.

One supervisor wanted an architect called in to look at the plans, and read the specifications. Another official said, as to the proposition to call in architects to inspect them and pass judgment, he believed that the more architects he called in, the greater would be the confusion and difficulty in arriving at a safe conclusion, because there was professional antagonism which would come into play, and defeat a fair judgment. The question for them to consider was, Had they confidence in Mr. Mundell as an architect? If they were going to submit them to architects for their judgment, they would go on until the crack of doom without having a new jail.

Another of the Board was in favor of more deliberation, lest by being over-hasty in adopting plans they found that they were called on to make alterations in new buildings which might have been avoided. This was the case all over the country. He had recently read books on architecture, and discovered that large buildings in London and Paris were put up without any alterations in the original plans being necessary. The reason of it was that on the other side they were careful in adopting plans. All the necessary steps were carefully considered before the work was begun. He would like to have the judgment of a competent builder on them and the specifications

The question of the commission to the architect then came up, and for an hour or more the Board displayed its collective ignorance.

A supervisor stated that it was too much to pay the architect five per cent for his services, which would amount to about $15,000, estimating that the cost of the new jail would be $300,000. The two architects on the new Municipal Building received only 2½ per cent on the cost.

The next motion was to print a number of copies of the specifications, but it was pointed out that as yet the Board had no control over them. Mayor Schroeder then said, "I move that the plans be adopted, provided that the architect accepts as his compensation 2½ per cent."

Another supervisor thought the rate proposed by the mayor, which would secure to Mr. Mundell about $7,500, was a fair compensation. Any professional man, though he should stand in the front of his profession, would be glad to accept it for services which would cover only about eighteen months. It should be borne in mind that Mr. Mundell's entire time would not be given to superintending the erection of the jail. He would still be at liberty to attend to other buildings. Moreover, the advertisement of his business arising from the superintendency of such a work would be worth more to him than $7,000. He argued that inasmuch as business and professional men had been obliged in these times to contract their prices, Mr. Mundell should do likewise. As far as he knew, five per cent was the highest compensation paid an architect at any time, and as other professional men have been compelled to lower their compensations, Mr. Mundell ought not to be an exception; which is certainly a very thrifty view, but entirely sophistical considering that the architects' fees fall with the reduction in the estimates of contractors.

Mayor Schroeder, in response to the remark of the committee that five per cent was the usual amount paid, said, "I deny that five per cent is the usual allowance to architects. I have had a great deal of building done for myself, and I can employ the best architects in my private capacity as a citizen, to make plans for three to four per cent. It is not necessary to employ a superintendent." Members cited instances of cheap contracts with architects; but your correspondent could have given them cases where so-called architects took work without any commission, and dear work it turned out for the owners. Compromises of three per cent were suggested, when at last the dickering was suddenly arrested by a charge of one of the members, that bribes of $250 per man had been offered for votes to the Mundell plans. At once there was a storm of well-assumed indignation, and an investigation was ordered. Throughout the talk not one word had been uttered on the merit of the designs, not a breath of an artistic instinct, — and I assume that a jail may be designed with some respect to the canons of art, — but a petty question of fees.

Turning from this company, it is refreshing to learn that Brooklyn is to have something fine if the Long Island Historical Society carry out its present purpose of building a permanent home. On Tuesday evening the 20th, a meeting of directors will appoint a building-committee; and then on a plat of land within a stone's throw of J. C. Cady's Academy of Design, and P. B. Wight's Mercantile Library, two of the best-designed buildings in the city, Mr. Eidlitz, if current rumor be true, will erect something in his best vein.

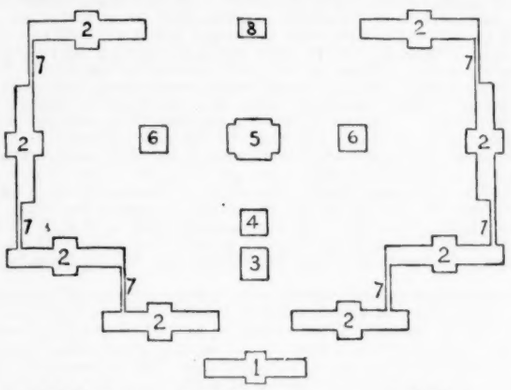
W.

THE PENNSYLVANIA HOSPITAL FOR THE INSANE.

PHILADELPHIA.

ON Tuesday the 13th the commission lately appointed by the State to select a site and erect a Hospital for the Insane for the Eastern District of Pennsylvania, chose of the five premiated architects, Messrs. Wilson Bros. to carry out the work. The design offered by this firm, which will be the ground-work of the working drawings, proposes to occupy a plat eight hundred by eleven hundred feet. On this it is proposed for the present to put up fifteen detached buildings. Eight of these, four to the front, and two to the rear, in *échelon*, with one at either side at right angles to these, form a hollow square; each building being one hundred feet from the adjoining building, and connected with it by a corridor having a stone basement and open gallery of iron above; the former for air flues and tramways. The central group of the front is the administrative building of three stories with basement and attic, having a tall central tower capped with a pyramidal roof in two stages, and belfry windows with large clock faces in their tympana on each of the four sides. The administrative building contains about twenty-four rooms. To the rear of this building are the chapel and the kitchen; and to the rear of these and the central object of the square is the boiler-house with its tall and ornamental brick chimney. This building is flanked on either side by a workshop, and in the rear of all on the open side of the square is placed a small dead-house. For the present there will be eight wards, half for males and half for females. Six of them will have accommodations for one hundred patients each, and two for seventy-five each. These buildings are each two hundred and sixty-four feet long, and consist of basement and two stories, the

rooms opening on a central passage. Each building has an entrance in the centre, which, the basement being high, will be approached by a flight of marble steps. The general construction of the building externally will be of red brick relieved by courses and



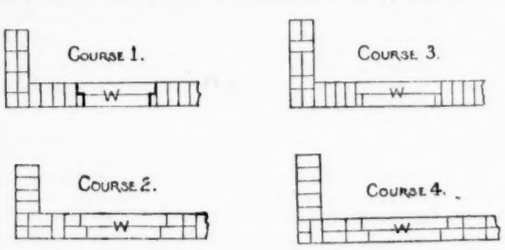
1. Administration.
2. Wards.
3. Chapel.
4. Kitchen.
5. Engine and Boiler.
6. Work-shops.
7. Corridors.
8. Morgue.

segmental arch-heads of stone. The roofs, which are of a rather low pitch, are to be of slate. The arrangement of the buildings allows of two other wards being erected in the future in *échelon* in the rear, which will complete the hollow square. Each ward will be provided with a stairway at either end, and also a private stairway in the central portion of the building. The stone to be used, though not definitely decided upon, will probably be the blue marble which abounds in that locality.

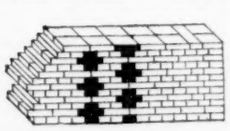
AMERICAN BRICKLAYING.

ST. LOUIS.

A POINT in American building which deserves attention is the bond of the brick walls. The total absence of any substantial, reasonable method of binding the bricks is in some parts of the country about the first thing to attract the eye of a foreign architect visiting this country, as we may see from time to time by remarks in the prominent technical papers of Europe. In an article published in the Vienna *Allgemeine Bauzeitung*, a very able architect, Mr. Gruner, writes, "One notices with astonishment that there is no sign of a rational bond." He comments rather severely on the merits of our American bricklayers, which I do



not consider just, the architects and contractors being really to blame, and continues, "The walls are so built as to consist of several parts connected by the intervening layer of mortar only; the outer portion or face is formed of stretchers entirely. After the great fire in Chicago, there were instances of walls separating so that one half fell on the streets, the other inward!" Indeed, the form of the bricks renders a regular bond impossible, but the aversion to the same is so great that channels for ventilation, etc., are formed in the walls with the help of tin flues. Stone fronts in many cases are not bonded to the main walls at all, being generally plastered on with cement.



Is it because the architects think the matter of so small importance, that they allow these abuses? Why is the English bond such a stranger among bricklayers? An American architect once said to me that "other bonds were not used here because the water had a better opportunity to penetrate the wall." This I believe to be wrong. Although I do not consider the English manner the best, it is preferable to any I have noticed in this country. Gwilt in his *Encyclopædia of Architecture* condemns even the Flemish bond in strong terms; but the American bond is certainly much worse. The former has at least some pretension to a transverse connection of the wall; but the placing of a row of headers every fourth, fifth, or sixth course (sometimes it only occurs every eighth), this being the whole binding used in America, is not at all sufficient to bond the parts of the brick-work, and there are many buildings whose fronts show not a single binder. That such a bond ruins quantities of brick-work in the course of time, is certain. A close observation of brick houses discovers cracks of all shapes and in all positions, whose origin may easily be traced to the miserable bond.

I should like to call attention to a manner of binding brick-work used exclusively in all better classes of buildings in Germany. The German Government prohibits the use of any other in its buildings, with the exception of some cases in fortifications where the head bond consisting of nothing but headers is used. It is preferable to the English in that the longitudinal connection is closer, having in addition to a regular change of the vertical joints in the header and stretcher courses, a similar change in the stretcher courses themselves, the vertical joints coming in line only once in five courses. The sketches show exactly the order in which the bricks are laid. But for this or the English bond we must first have bricks so formed that two heads plus the joint equals one stretcher.

One reason why our brickwork is less substantial than the German is that our fat lime is not given time enough to slack sufficiently before it is used. There are always portions which require more time to slack than the main body. In Germany the lime is slacked and then allowed to run into pits, where it remains four to six weeks before it is used. The want of room does not allow this operation to be performed on the building-site in many instances, and the larger contractors have their own pits generally as close to the railroad as possible, where they slack the lime, which is then transported from these pits to the buildings in carts built expressly for the purpose. Great care should also be used in slacking the lime, that neither too much nor too little water is used, as either error reduces the binding properties of the lime. We need not say that particles of unslacked lime are very injurious to brick-work.

For the proportion of lime to the sand, Menzel, a well-knowu German architect, gives the following rule: "Take a certain quantity of the sand to be used, and pour water on the same until it will absorb no more. The quantity of water used is equal to the amount of lime necessary."

C. C. H., JUN.

RAPID PLASTERING.

MR. HITCHINS, of Stoke Newington, has introduced, says the *Building News*, a new method of forming ceilings and other plaster-work, which, for durability, saving of time, and cleanliness, is unrivalled. By means of this system, the plaster is prepared beforehand in slabs, which are fixed expeditiously to the joists, forming the ceiling at once, as it would be when lathed and plastered with the two coats of lime and hair in the old process. The slabs, or sheets, are made in the following manner: A layer of plaster of Paris, in a moist or plastic state, is spread evenly on a flat surface, surrounded by raised edges of the form to produce the desired bevel of the edges of the slab or sheet; and upon this first layer of plaster is laid a sheet of canvas or other woven fabric of proper size, or a thin layer of loose fibres, which is made to embed itself into and adhere to the plaster. Two laths are then laid along two opposite edges of the canvas, upon which another layer of plaster is spread evenly; and before it sets a rough broom is passed over the surface of this second layer of plaster to form a key for the finishing coat. When the plaster is set, the slabs are nailed to the joists, as before mentioned, and the joints are made good with plaster of Paris. The third or finishing layer of lime and plaster is then applied to the ceiling in the ordinary way. Besides the advantages derived from rapid fixing, with the minimum of dirt and inconvenience, the new ceiling is practically uninflammable, and very economical to put up. Moreover, unlike the old plaster ceilings, it can never become detached from the joists; in fact, besides being self-supporting, it braces and strengthens all partitions and slight timbers.

NOTES AND CLIPPINGS.

ACCIDENT TO A CHURCH. — The flooring of the Methodist church at Searsport, Me., broke down the other night, through the beams rotting off. A revival-meeting was in progress, but no one was injured. A similar accident occurred at the same church about four years ago.

NEW ARCHITECTURAL PHOTOGRAPHS. — Messrs. Bedford, Lemere, & Co., of London have sent over another portfolio of photographs, containing 100 views of their latest work. The collection embraces buildings by Devey, Calleut, Shaw, Robson, Waterhouse, Bloomfield, and Butterfield, also a collection of views of old half-timbered mansions and churches of the sixteenth and seventeenth centuries. These may be seen at the office of H. Hudson Holly, 111 Broadway, New York.

CEMENT FOR GLASS, ETC. — A new and very strong mucilage, capable of fastening together wood, porcelain, or glass, is described in the *Journal de Pharmacie*. To a strong solution of gum-arabic, measuring 8½ fluid ounces, add a solution of 30 grains of sulphate of aluminum, dissolved in two-thirds of an ounce of water.

MONUMENTS TO GEN. LEE. — The design of Mr. John Roy, a local sculptor, has been adopted for the $30,000 monument to Lee to be erected at New Orleans. It proposes a mound of earth 188 feet in diameter at the base and 12 feet high in the centre, sloping in all directions to the ordinary ground level, the central portion 72 feet square, to be level at the elevation of 12 feet. The slope on each side of this centre square will have a base of 58 feet and a rise of 12 feet. In the centre of this mound the monument proper will be placed upon piles, capped with timber spiked and bolted to the piles, then, to preserve the wood from decay, covered with concrete, upon which the brick and granite foundation will be built, which will receive the marble column that is to sustain the statue. A white marble Doric column, 10 feet in diameter at its base and 60 feet in height, with winding staircase through its centre, will be placed on a granite stylobate of four steps each 3 feet high; and the statue of Gen. Lee, 15 feet in height, will rest on a die 7 feet 8 inches in height, thus making the entire height from the ground to the top of the statue 106 feet 8 inches.

Meanwhile the Commissioners of the Lee Monument Association at Richmond have postponed for one year the award for an equestrian statue of Gen. Lee, because of a disagreement with the Ladies' Memorial Association, and a lack of money without their aid.

DEFACEMENT OF A SOLDIERS' MONUMENT. — The monument to the memory of the Confederate dead at Chattanooga, completed and ready to erect, was defaced beyond repair Saturday night Nov. 17, by unknown persons.

THE HUDSON RIVER TUNNEL. — Now that all legal opposition to the Hudson River Tunnel has stopped, there is no doubt but that work on the tunnel will be pushed forward without delay.

A GLASS ROOF. — The new Union Depot at Pittsburg, Penn., is to be covered by a glass roof, measuring 600′ x 140′.

STATUE TO GEN. GREENE. — The Rhode Island delegation has selected the circle at the intersection of Massachusetts and Maryland Avenues, Washington, as the site for the equestrian statue of Major-Gen. Nathaniel Greene, now being executed by H. K. Browne.

THE HIGH BLANTYRE COLLIERY EXPLOSION. — A singular feature of the explosion in the High Blantyre Colliery, Scotland (by which 215 lives were lost on Oct. 22), was the uprush of the burning gas through the downward shaft, though the gas is believed to have taken fire at the base of the upcast shaft. The shortest passage between the two shafts in the mine was fully a third of a mile long, and the ventilation threw out 100,000 cubic feet of air per minute. Although the reversal of this great current of air at the time of the explosion seems strange, it is not without precedent. The following extract from a lecture delivered by Professor W. W. Smyth, before the Royal School of Mines, London, and recently published in the *Engineering and Mining Journal*, indicates the chances of such an occurrence: "Some strange effects occasionally follow these accidents; thus the lecturer has seen one case himself where the ventilating current was reversed by the explosion, and all the smoke, etc., drawn back into the mine, where the air could be seen oscillating for a short time over the upcast, and then going bodily down. In this case every one in the mine was killed." Professor Smyth recommends that there should be a great distance between the shafts, so as to afford the miners abundant room for escaping from the ignited gas and the choke-damp which follows it. But, although this precaution was not wanting in the Scotch mine, no advantage could be taken of it in rescuing the unfortunate miners, because the walls of the passages were thrown down and the shafts were also choked with *débris*. Many hours had to be spent in removing obstructions, and meanwhile nearly all the inmates of the mine were suffocated. — *N. Y. Tribune.*

THE NEW LONDON POST-OFFICE. — The site of the proposed new Post Office on the Thames Embankment, London, extends from Blackfriars Bridge to Temple Gardens.

ASPHALT PAVEMENT. — The alternations of heat and cold so affected the asphalt pavement of one of the foot-bridges over the Seine at Paris (the *Pont des Arts*), that the vibration of the bridge caused innumerable cracks and rifts to penetrate its substance. A new paving of slabs about sixteen feet square has been lately laid. These slabs, which are composed of gravel and asphalt in the usual proportions, are divided from one another by a space one and a quarter inches in width, which is filled with pure asphalt. It is hoped that the superior elasticity of the pure asphalt will prevent further deterioration through contraction or oscillation.

PERMANENT TRADE EXHIBITIONS. — A German paper states that a permanent exhibition of German manufactures will soon be opened both in Hamburg and London, where both exporters and importers will be able to confer and have an opportunity of seeing the latest productions of German industry. A similar project has been submitted by Mr. Firmin Dufoure to the leading merchants of France, and through Messrs. Windslow, Lanier & Co., bankers, has brought the subject of the proposed exhibition or exchange before the merchants of New York. Of it he says, "It would not be an exhibition in the ordinary sense of the word, but an international exchange for the purchase and sale on commission of goods. A large building in Paris would be devoted exclusively to American goods and for the shipment of French goods ordered by a similar establishment in New York, which of course would contain the French samples, and would, if necessary, ship the products of this country ordered through the Paris branch."

MODELS FOR GERMAN PATENTS. — The only articles for which models are required in German patent applications are fire-arms.

DISCOVERY OF A CRUSADERS' CHURCH. — On the road from the Mount of Olives to Bethany the remains of a Crusaders' church have recently been discovered. In his official report, which appears in the *Athenæum*, Lieut. Kitchener states that tradition has long pointed out this spot as the place where the Saviour mounted the ass for his triumphal entry into Jerusalem. In the chapel, which dates from the twelfth or thirteenth century, there is an almost square block of masonry covered with paintings, which are well executed but badly disfigured. On the south side is represented the raising of Lazarus; on the north are the disciples fetching the ass; on the west there is a niche covered by an arch which was probably supported by two small columns; below the niche is a portion of an inscription still remaining. This square block is supposed to be either an altar, a shrine, or a portion of the rock cut out and ornamented. The walls of the small chamber to the south are also painted with a design of squares containing circles, and the walls of the church are painted in a common pattern. The shield of Hamseh has been taken down from the mosque by the Pasha, and is now in the Seraïl. It appears to have been the cover of a baptismal font, or of some vessel, and is made of bronze, containing a great deal of silver. The work appears to be Italian of the twelfth century, and is very beautiful.

TECHNICAL SCHOOLS ABROAD. — It appears from recent reports of the Commissioner of Education, that Austria maintains 1,037 schools for technical instruction, 4,296 teachers, and 67,713 pupils; besides which there are schools of forestry, mining, and agriculture. Bavaria shows 1,671 industrial schools for girls, with 1,837 teachers, and 71,635 pupils; also a polytechnic school at Munich, 36 technological schools, 4 of agriculture, with many courses of lectures on practical subjects. In Germany there are 34 schools of architecture, 25 of mining, 17 of forestry, 108 of commerce, 146 of agriculture, 10 veterinary, and 86 other technical schools. Denmark has 49 "Farmers' High Schools," with 3,135 students, of whom, curiously enough as it would seem in this country, 1,003 are females. In Holland there are 11 navigation schools and 32 industrial and drawing schools. In Switzerland no less than 4,373 females are employed in schools teaching needle-work.

COLOR-POISONING. — A belief in color-poisoning by means of green dresses and wall-papers has already been forced upon the public by some tolerably conclusive evidence; but it seems that the mischievous propensities of this color are far from being fully exposed. A French *savant*, M. Paul Bert, has just exhibited against it articles of impeachment of the gravest character, supported by reports of a whole series of startling experiments. If his theory is true, it is not only the arsenic used in producing the color which does the injury, but the actual color itself; and a mere ray of green light is capable of affecting the health of the person exposed to it, apart from all aid afforded to it by the smell or presence of arsenic. To demonstrate this alleged fact, M. Bert has submitted several specimens of the sensitive-plant to rays of different colors thrown upon them through stained glass; and in every case those which were treated to the most brilliant green light withered and died in the shortest time. In those plants which were exposed to a red light, a peculiar phenomenon was observed; the tip or spikes of the leaves prolonged themselves, and grew forward in a lean and hungry fashion horizontally with the branch from which they sprang; while in a blue light the contrary effect was produced, the spikes standing out abruptly and perpendicularly from their stem. On one of the plants being enclosed in a sort of lantern, having red glass on one side and green on the other, instead of shrinking away from the poison on their right to the roseate antidote on their left, the leaves, as if by a fatal fascination, turned with one consent the other way, and literally looked death in the face. — *Pall Mall Gazette.*

MUSK. — The enduring odor of musk is marvellous. When Justinian, in 538, rebuilt what is now the Mosque of St. Sophia, the mortar was charged with musk, and to this day the atmosphere of the building is filled with the odor; which may be due to this cause, or as probably to the burning of incense as may possibly be customary in the mosque.

INSTANTANEOUS LIGHTING. — Some Frenchmen have recently patented a contrivance for obtaining instantaneous light, by merely depressing a button. The movement enables an electric current to pass through a platinum wire, heating it to redness; the wire being surrounded by an atmosphere saturated with benzine, quickly becomes white hot. This lights a small lamp which burns benzoline, and gives a very bright light. The whole apparatus is compact and portable.

EXPLOSION OF A GAS-HOLDER. — The gas-holder of the new gas company at Indianapolis exploded at noon, Nov. 15. The force of the explosion was felt at the Arsenal, three miles distant. The holder was ninety feet in diameter and eighteen feet in height, and was seen first to rise up from its position of half immersion in the tank to the full height, with a rumbling sound, and then burst into fragments. The top portion rose to a height of 300 feet. Fortunately the workmen had just left the yard for dinner, so that no one was hurt, although much damage was done to neighboring buildings. The works had just been completed. The cause of the explosion is supposed to have been the mixing of hydrogen gas with air, which was in the holder when the gas was introduced for the purpose of testing the mains recently laid. The loss is about $20,000.

A SUBSTITUTE FOR GLASS PLATES IN PHOTOGRAPHY. — Paper prepared with wax, and covered with collodion, according to a newly invented process, is offered as a substitute for glass plates for photographic purposes in exploring expeditions. It is said to retain its sensitive properties for more than two years, and the development after the impression is easy. The negative can be preserved for any length of time.